

AUDIO PROCESSING FOR MONO SIGNALS

FIELD

[0001] Embodiments of this invention relate to generating a multi-channel signal representation, in particular for speech, audio and video signal.

BACKGROUND

[0002] There is current development in voice communications to move towards higher voice quality. There are two main dimensions how to achieve this: Increase the signal bandwidth from narrowband to wideband and to superwideband and ultimately to full bandwidth, and the other dimension is to add spatial audio in the form of stereo, binaural stereo or multi-channel playback.

[0003] In order to capture true spatial audio at least two microphones and preferably more are needed to capture, process and finally render realistic sounding field. However, low cost devices may only have a single microphone and adding more is cost prohibitive.

SUMMARY OF SOME EMBODIMENTS OF THE INVENTION

[0004] Thus, a cost reduced approach for generating a multi-channel signal is desirable, for instance with respect to application of speech, audio or video signals.

[0005] According to a first aspect of the invention, a method is disclosed, comprising generating a signal representation at least based on a noise reduced component from a signal and on a noise component from the signal, said signal representation comprising at least two channel representations.

[0006] According to a second aspect of the invention, an apparatus is disclosed, which is configured to perform the method according to the first aspect of the invention, or which comprises means for performing the method according to the first aspect of the invention, i.e. means for generating a signal representation at least based on a noise reduced component from a signal and on a noise component from the signal, said signal representation comprising at least two channel representations.

[0007] According to a third aspect of the invention, an apparatus is disclosed, comprising at least one processor and at least one memory including computer program code for one or more programs, the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus at least to perform the method according to the first aspect of the invention. The computer program code included in the memory may for instance at least partially represent software and/or firmware for the processor. Non-limiting examples of the memory are a Random-Access Memory (RAM) or a Read-Only Memory (ROM) that is accessible by the processor.

[0008] According to a fourth aspect of the invention, a computer program is disclosed, comprising program code for performing the method according to the first aspect of the invention when the computer program is executed on a processor. The computer program may for instance be distributable via a network, such as for instance the Internet. The computer program may for instance be storable or encodable in a computer-readable medium. The computer program may for instance at least partially represent software and/or firmware of the processor.

[0009] According to a fifth aspect of the invention, a computer-readable medium is disclosed, having a computer program according to the fourth aspect of the invention stored thereon. The computer-readable medium may for instance be embodied as an electric, magnetic, electro-magnetic, optic or other storage medium, and may either be a removable medium or a medium that is fixedly installed in an apparatus or device. Non-limiting examples of such a computer-readable medium are a RAM or ROM. The computer-readable medium may for instance be a tangible medium, for instance a tangible storage medium. A computer-readable medium is understood to be readable by a computer, such as for instance a processor.

[0010] According to a sixth aspect of the invention, a computer program product is disclosed, comprising at least one computer readable non-transitory memory medium having program code stored thereon, the program code which when executed by an apparatus cause the apparatus at least to generate a signal representation at least based on a noise reduced component from a signal and on a noise component from the signal, said signal representation comprising at least two channel representations.

[0011] According to a seventh aspect of the invention, a computer program product is disclosed, comprising one or more sequences of one or more instructions which, when executed by one or more processors, cause an apparatus at least to generate a signal representation at least based on a noise reduced component from a signal and on a noise component from the signal, said signal representation comprising at least two channel representations.

[0012] In the following, features and embodiments pertaining to all of these above-described aspects of the invention will be briefly summarized.

[0013] A signal representation is generated at least based on a noise reduced component from a signal and based on a noise component from the signal, said signal representation comprising at least two channel representations. The signal may be denoted as original signal in the sequel.

[0014] For instance, said original signal may represent a speech, audio or video signal. Furthermore, as an example, said original signal may represent a mono signal which may be generated by a single signal source configured to record/or capture an audio or video signal from the environment, e.g. like a single (mono) microphone or a single (mono) video camera or any other well-suited single signal source.

[0015] For instance, the signal representation comprising said at least two channel representations may represent a kind of spatial signal representation. As an example, said spatial signal representation may be a kind of stereo, binaural stereo or another multi-channel playback signal representation, wherein said at least two channel representations may form said spatial signal representation.

[0016] It has to be understood that a multi-channel signal represents any representation comprising or being associated with at least two channel representation.

[0017] For instance, at least two of the at least two channel representations may differ at least partially from each other and/or at least two of the at least two channel representations may be substantially the same or may be equal.

[0018] Said at least two channel representations are generated based on a noise reduced component from the original signal and on a noise component from the original signal.

[0019] The noise reduced component may be a component representing the main information content of the signal and